

VERSION WITH MARKING TO SHOW CHANGES MADE

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CLAIMS

What is claimed is:

1. A method of propelling watercraft, including:

- mounting at least two propelling means on a watercraft with ability to be rotated around a transverse axis and around at least two radial axes with the same speed;

- rotating said at least two propelling means simultaneously around said transverse axis and around said at least two radial axes with the same speed, wherein:

- the speed of rotation around each at least two radial axes is equal to the speed of rotation around the transverse axis;

- said transverse axis being disposed substantially perpendicular to the advancement direction of said watercraft;

- said at least two radial axes being disposed substantially perpendicular to said transverse axis and can be rotated together with said at least two propelling means around said transverse axis;

- each of said at least two propelling means including at least one substantially flat propeller blade balanced relative to one of said at least two radial axes so that the centers of gravity of said propelling means being disposed substantially on said radial axes.

2. The method of propelling watercraft of claim 1, further including:

- disposing said at least one substantially flat propeller

blade substantially in plane of said rotation around one of said at least two radial axes.

3. The method of propelling watercraft of claim 1, further including:

- disposing said at least one substantially flat propeller blade at an acute angle with plane of said rotation around one of said at least two radial axes.

4. The method of propelling watercraft of claim 1, further including;

- mounting three said propelling means with ability to be rotated around said transverse axis and around three said radial axes;

- rotating each of said three propelling means simultaneously around said transverse axis and around one of said three radial axes with the same speed, wherein:

- said three radial axes being disposed substantially 120 degrees from each other around said transverse axis.

5. The method of propelling watercraft of claim 1, further including:

- mounting at least two pairs of said propelling means with ability to be rotated around said transverse axis and around at least two pairs of said radial axes;

- rotating said two pairs of said propelling means simultaneously around said transverse axis and around said two pairs of radial axes with the same speed, wherein:

- each said pair of radial axes being disposed along one line

perpendicular to said transverse axis;

- said propelling means in each said pair of propelling means being rotated in substantially parallel planes;

- one said pair of propelling means being rotated in planes which are substantially perpendicular to planes of rotation of another said pair of propeller blades.

6. The method of propelling watercraft of claim 5, wherein:

- said two pairs of radial axes being disposed along two intercrossed lines;

- said intercrossed lines being perpendicular to said transverse axis and to each other.

7. The method of propelling watercraft of claim 1, further including:

- disposing said transverse axis on such a height over the water level that said propeller blades extend into the water when they are oriented substantially downwards.

8. A propulsion apparatus for propelling watercraft, including:

- at least one driving shaft having an axis of rotation disposed substantially perpendicular to the advancement direction of said watercraft;

- at least one planetary gearbox mounted on said driving shaft and having at least two radial output shafts each having an axis of rotation disposed substantially perpendicular to said driving shaft and constrained by a planetary gear engagement to rotate about their axes of rotation with the speed of rotation of said driving shaft about its axis of rotation;

- means for rotating said planetary gearbox around the axis of said driving shaft, wherein:

- said at least one planetary gearbox includes at least one sun bevel gear mounted coaxially with said driving shaft and at least two planet bevel gears mounted on said at least two radial output shafts;

- at least two propelling means mounted on said at least two radial output shafts and disposed perpendicular to the axes of rotation of said radial output shafts;

- each of said at least two propelling means includes a substantially flat propeller blade which is balanced relative to the axis of one of said radial output shaft so that the center of gravity of said propelling means been disposed on said axis of said radial output shaft.

9. The propulsion apparatus of claim 8, wherein:

- said substantially flat propeller blade is disposed substantially in plane of rotations of said propelling means around the axis of one of said radial output shafts.

10. The propulsion apparatus of claim 8, wherein:

- said propeller blade is disposed at acute angle with plane of rotation of said propelling means around the axes of one of said radial output shafts.

11. The propulsion apparatus of claim 8, wherein:

- said driving shaft, said at least one planetary gearbox and said at least two propelling means are mounted on an outboard engine.

12. The propulsion apparatus of claim 8, wherein:

- said driving shaft, said at least one planetary gearbox and said at least two propelling means are disposed on such a height over the water level that said at least two propeller blades extend into the water when they are oriented substantially downwards.

13. The propulsion apparatus of claim 8, wherein:

- said planetary gearbox includes three said radial output shaft disposed substantially perpendicular to the axis of said driving shaft and substantially 120 degrees from each other.

14. The propulsion apparatus of claim 8, wherein:

- two said planetary gearboxes are mounted on said driving shaft.

- each of said two planetary gearboxes includes two said radial output shafts disposed along a common axis perpendicular to the axis of said driving shaft and two said propelling means mounted on said radial output shafts, wherein:

- said planes of rotations of said propelling means mounted on said radial output shafts of one of said two planetary gearboxes are substantially perpendicular to said planes of rotations of said propelling means mounted on said radial output shafts of another said planetary gearboxes.

15. A propulsion apparatus for propelling watercraft, including:

- at least one support rod having an axis of rotation disposed substantially perpendicular to the advancement direction of said

watercraft;

- at least one planetary gearbox mounted on said support rod with ability to be rotated around the axis of said support rod, said planetary gear box having at least two radial output shafts each having an axis of rotation disposed substantially perpendicular to said support rod, said radial output shafts being constrained by planetary gear engagement of said planetary gearbox to rotate about their axes of rotation with the speed of rotation of said planetary gearbox about its axis of rotation;

- at least two propelling means affixed perpendicular to said two radial output shafts, said propelling means including substantially flat propeller blades and counter-weights fixed on said propelling means and balanced so that the centers of gravity of said propelling means being disposed on the axes of said radial output shafts, said propeller blades being disposed substantially in planes of rotations of said propelling means around the axes of said radial output shafts.

16. The propulsion apparatus of claim 15, wherein:

- four said radial output shafts being disposed along two intercrossed lines which are substantially perpendicular to the axis of said support rod and to each other, two pairs of said propelling means being mounted on said four radial output shafts, wherein:

- said planes of rotations of one pair of said propelling means around said radial output shafts are substantially perpendicular to said planes of rotations of another pair of said propelling means around said radial output shafts;

- said planetary gearbox includes a sun bevel gear mounted on said support rod, at least one planet bevel gear engaged with said sun bevel gear and four identical bevel gears engaged with each other.

17. The propulsion apparatus of claim 15, wherein said support rod is disposed substantially horizontally in such a height over the water level that said fluid moving means extend into the water when they are orientated generally downwards.

18. The propulsion apparatus of claim 15, wherein said planetary gearbox is rotated by an outer rotor type brushless electric motor, including:

- at least one inner stator secured to said support rod;
- at least one outer rotor disposed coaxially with said support rod and secured to said planetary gearbox.

19. The propulsion apparatus of claim 18, wherein:

- said inner stator includes a plurality of protrusions serving as cores for electrical coils.

20. The propulsion apparatus of claim 18, wherein:

- said outer rotor comprises a plurality of permanent magnets disposed on inside surface of said outer rotor.